# SOUTENANCE DE THÈSE

# M. Cristino DE SOUZA JUNIOR

Soutiendra sa thèse de **doctorat** sur le sujet **:**

**Drones cooperation for tracking an intruder drone**

*Unité de recherche* : ***Heudiasyc – UMR CNRS 7253***

**Le lundi 19 avril 2021 à 15h**
**en visioconférence en suivant ce lien :**
https://utc-fr.zoom.us/j/82169125335?pwd=SjRoeTMrUWYvVWd1cTFJUHNJVi9DQT09

**Devant le jury composé de :**

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**Motivation** : In the last decades, we have seen an abrupt popularization of mobile robots around the world. With that, the civil authorities have faced a new challenge: how to stop robots' criminal usage, especially drones. Unauthorized drone flights over protected areas, such as over airports and prisons, have been common in newspaper headlines. Although there are solutions, the current technologies have serious drawbacks, such as high-cost structure required, side effects, or inefficiency. Against this backdrop, an interesting solution has arisen lately: the use of anti-drone drones, which has proved itself an efficient and less costly solution.

**Abstract**: This work is dedicated to studying multi-agent strategies for intruder's interception and its applicability in real-time robots. Although there is a vast literature, both for single pursuit and collective motions, the group-pursuit still remains an open problem. The systems have become too complex for a deterministic solution, and current multi-agent techniques are insufficient to describe the complex collective hunting movement.

We address this problem with strategies that share concepts with classical multi-agents methods, such as local sense, limited interaction, and decentralization decision-maker, but having the pursuer behavior based on navigation guidance laws, commonly used in missiles' guidance. Furthermore, we differ from most existing solutions by considering the environment's perception in polar and relative coordinates, which is a consistent assumption considering a real-robots application.
In the core of our pursuit strategies, we have explored classical guidance strategies, such as Proportional Navigation and Deviated Pursuit, and a more recent approach, Deep Reinforcement Learning.

We also investigate complementing behaviors, such as flocking formation and collision avoidance, used in other phases of pursuit mission. Finally, a proof-of-concept of our strategies was also provided using real-time quadcopters.